

What is Claimed is;

1. A battery pack malfunction detection apparatus that detects a malfunction in a battery pack constituted with a plurality of chargeable/dischargeable cells, comprising:

5 malfunction detection devices each provided in correspondence to a predetermined number of cells to detect an overcharge malfunction in the corresponding predetermined number of cells during an overcharge detection period and to detect an over-discharge malfunction in the corresponding 10 predetermined number of cells during an over-discharge detection period; and

 a decision-making device that makes a decision as to whether or not a cell in an overcharge malfunction state or a cell in an over-discharge malfunction state exists based 15 upon a signal input from each of the malfunction detection devices, wherein:

 each of the malfunction detection devices outputs a first signal if an overcharge malfunction is detected in any of the corresponding predetermined number of cells and outputs a 20 second signal if no overcharge malfunction is detected during the overcharge detection period, outputs the second signal if an over-discharge malfunction is detected in any of the corresponding predetermined number of cells and outputs the first signal if no over-discharge malfunction is detected 25 during the over-discharge detection period, and alternately

outputs the output signal during the overcharge detection period and the output signal during the over-discharge detection period to the decision-making device through time sharing.

5

2. A battery pack malfunction detection apparatus according to claim 1, wherein:

the decision-making device decides that there is a cell with an overcharge malfunction if the first signal is input from the malfunction detection device both during the overcharge detection period and during the over-discharge detection period.

3. A battery pack malfunction detection apparatus according to claim 1, wherein:

the decision-making device decides that there is a cell with an over-discharge malfunction if the second signal is input from the malfunction detection device both during the overcharge detection period and during the over-discharge detection period.

4. A battery pack malfunction detection apparatus according to claim 1, wherein:

each of the malfunction detection devices includes a voltage comparator that compares a terminal voltage at each

of the corresponding predetermined number of cells with a reference voltage, outputs the first signal if the terminal voltage at any cell is higher than the reference voltage by using an overcharge decision-making voltage as the reference 5 voltage during the overcharge detection period and outputs the second signal if the terminal voltage at any cell is lower than the reference voltage by using an over-discharge decision-making voltage as the reference voltage during the over-discharge detection period.

10

5. A battery pack malfunction detection apparatus according to claim 1, further comprising:
a clock generation device that generates a clock signal, wherein:

15 each of the malfunction detection devices switches between an overcharge malfunction detection and an over-discharge malfunction detection based upon the clock signal generated by the clock generation device.

20 6. A battery pack malfunction detection apparatus according to claim 1, wherein:

the overcharge malfunction detection period and the over-discharge malfunction detection period extend over lengths of time different from each other.

25

7. A battery pack malfunction detection apparatus according to claim 1, wherein:

if a current consumed in the battery pack malfunction detection apparatus when the malfunction detection devices 5 output a signal indicating that none of the corresponding predetermined number of cells is in an overcharged state is different from a current consumed in the battery pack malfunction detection apparatus when the malfunction detection devices output a signal indicating that none of the 10 corresponding predetermined number of cells is in an over-discharged state, the signal requiring a larger current consumption is output over a smaller length of time than the signal requiring a smaller current consumption.

15 8. A battery pack malfunction detection apparatus that detects a malfunction in a battery pack constituted with a plurality of chargeable/dischargeable cells, comprising:

a plurality of malfunction detection means, each provided in correspondence to a predetermined number of cells, 20 for detecting an overcharge malfunction in the corresponding predetermined number of cells during an overcharge detection period and an over-discharge malfunction in the corresponding predetermined number of cells during an over-discharge detection period; and

25 a decision-making means for making a decision as to

whether or not a cell in an overcharge malfunction state or a cell in an over-discharge malfunction state exists based upon a signal input from the malfunction detection means, wherein:

5 each of the plurality of the malfunction detection means outputs a first signal if an overcharge malfunction is detected in any of the corresponding predetermined number of cells and outputs a second signal if no overcharge malfunction is detected during the overcharge detection period, outputs the
10 second signal if an over-discharge malfunction is detected in any of the corresponding predetermined number of cells and outputs the first signal if no over-discharge malfunction is detected during the over-discharge detection period, and alternately outputs the output signal during the overcharge
15 detection period and the output signal during the over-discharge detection period to the decision-making means through time sharing.

9. A battery pack malfunction detection method for
20 detecting a malfunction in a battery pack constituted with a plurality of chargeable/dischargeable cells comprising:
 generating a first signal upon detecting an overcharge malfunction in any of the cells and a second signal if no overcharge malfunction is detected during an overcharge
25 detection period;

generating the second signal upon detecting an over-discharge malfunction in any of the cells and the first signal if no over-discharge malfunction is detected during an over-discharge detection period;

5 outputting the signal generated during the overcharge detection period and the signal generated during the over-discharge detection period alternately through time sharing; and

making a decision as to whether or not there is a cell
10 manifesting an overcharge malfunction or an over-discharge malfunction based upon the signal output through time sharing.